

**STACHY IN THE STACKS?
ONE LIBRARY'S EXPERIENCE WITH *STACHYBOTRYS ATRA*.**

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ABSTRACT: In 1997, the Halifax Fisheries Library was in the process of moving the entire collection of 10,000 monographs, 100,000 government documents and 100,000+ journal volumes to merge with the collection of the Library at the Bedford Institute of Oceanography, situated across the harbour in Dartmouth, Nova Scotia. Moving and merging collections are complex tasks with extensive planning necessary before any items can be moved. In the middle of this strategic manoeuvre, *Stachybotrys atra* (SA) was discovered in some areas of the building where the collection was located. SA is a greenish-black mould producing several toxic chemicals which cause health risks.

This paper presents documentation of what happened to the collection after the discovery of the toxin. No protocol existed for treatment of this mould on library (or paper) materials. Are we testing our collections adequately for moulds? Are we putting our own library staff at risk daily in what may be an unsafe environment?

Located in the Halifax Fisheries Laboratory, the Halifax Fisheries Library has been serving Atlantic Canada's federal Department of Fisheries and Oceans personnel, university students and the public since 1930. As part of departmental cost cutting measures in the mid 1990s, it was decided that the 70 year old building would be sold, staff and research programs would be redistributed, and the library would merge with its "sister" library across the harbour at the Bedford Institute of Oceanography. Located right on the harbour in downtown Halifax, Nova Scotia, a high tide and strong winds could and occasionally did flood the basement. Leaks in the roof throughout the building, including the library, were not uncommon.

Moving and merging collections are complex tasks requiring extensive planning. Preparing for the move began in the Spring of 1996 with an anticipated moving date in the Fall of 1997. We were as prepared as we thought we could be until *Stachybotrys atra* (SA) was discovered in several areas of the building in which the library was located as well as in a few library ceiling tiles. Suddenly, the collection wasn't going anywhere.

Stachybotrys atra (SA) is a greenish-black, gelatinous mass of spores that thrives on materials with high cellulose and low nitrogen content. This toxigenic fungus (mould) is found worldwide on building materials, paper, straw and hay which have become chronically moist or water-damaged due to excessive humidity, water leaks, condensation, or flooding. SA produces several toxic chemicals called trichothecene mycotoxins which are known to be toxic to humans who are exposed to significant quantities. Individuals with chronic exposure to the toxin produced by SA have reported cold and flu symptoms, respiratory problems, sore throats, diarrhea, headaches, dermatitis, intermittent local hair loss and chronic fatigue (University of Minnesota 1997). It has also been linked to bleeding, immune suppression and adverse effects on the central nervous system, (Indoor Air Solutions 1996). According to a Health Canada pamphlet published in 1994, the percentage of people who develop symptoms is low, however, persons with a history of allergic conditions, chronic inflammatory lung diseases or those who are immunocompromised should be removed from affected areas. According to that same pamphlet, safe exposure levels have not yet been established. The toxic and allergenic health response depends on exposure circumstances and dose (Johanning *et al.* 1993). Long-term health risks are not well known (Johanning *et al.* 1996).

The heavily contaminated areas in the building, none of which was located in the library, were immediately isolated. These areas were sealed off with polyethylene to reduce the possibility of spreading fungal contamination to other parts of the building. It was determined that the presence of airborne concentrations of the mould spores in the non-heavily contaminated areas (6 CFU/m³–19 CFU/m³) did not warrant immediate removal of the employees from the building, however, a plan for the relocation of all staff in the building was implemented (Health Canada 1997a, 1997b). The library remained open to internal staff but discontinued contact with the public. No items could leave the library, so loans and ILLs were discontinued. Occupational health nurses met with employees to discuss potential health risks and those with additional health concerns were invited to contact Health Canada personnel to complete an Indoor Air Quality Questionnaire and see a medical officer if necessary.

A protocol for decontaminating all items leaving the building was developed by a local mycologist. Non-porous materials such as glass, plastic, metal surfaces, etc., were cleaned with a 5–10% bleach solution, followed by HEPA (high efficiency particulate air) vacuuming. Initially, we were led to believe that this bleach solution would be used to decontaminate library material. We instantly declared this to be unacceptable. After persistent protestations, we got assurances that the books would not be decontaminated using any chemicals or liquid solutions. The treatment method for books and paper products was based on the guidelines defined in *Mold: Managing a Mold Invasion: Guidelines for Disaster Response* (1994). Because the building was considered "contaminated", everything that left the building had to be discarded or treated. None of the lab personnel enjoyed the very arduous task of discarding, sorting and packing up

materials for decontamination, but packing one's personal affects, office and lab supplies paled in comparison to the more than 200,000 library items that would have to go through a two step decontamination procedure. The thought of every item being handled twice (by non librarians no less) before reaching its final destination was cause for great concern, not to mention intermittent stress.

A local company – not library staff – was contracted for the job. The first step involved surface cleaning with a HEPA vacuum in the library. HEPA filters are necessary because they will trap most mould spores before they can exit the vacuum cleaner (American Institute for Conservation Book & Paper Group 1994). Wearing protective, disposable suits and respirators with HEPA filters, workers vacuumed all the books and immediately placed them in 3 foot long cardboard boxes, custom designed for the move. (A standard library shelf in North America is 3 feet long.)

The second stage involved taking the 500 boxes to the decontamination chamber where they would undergo another process. The “decon chamber” was a temporary structure, constructed in the loading dock of the building, with polyethylene sheets for walls securely affixed to the ceiling and floor. All items entered the decon chamber at one end, received treatment, got placed in clean cardboard boxes in an ante-chamber, and left the chamber at the opposite end “spore-free”. The treatment for the books involved fanning the items in front of a negative pressure unit. This unit filters the flow of air in an enclosed space keeping the air continuously clean. Outside this decon chamber, movers loaded these boxes into a truck and finally, they were on their way to their new location across the harbour.

Initially, we insisted a library staff member supervise all stages of the decontamination process to ensure careful handling of the books and to number the boxes. This was not a particularly enjoyable task as it meant wearing the uncomfortable gear and standing all day, but in the name of order and control, we thought it necessary. After several days, it was decided that a library presence in the decon chamber was not essential. The books were being treated satisfactorily, kept in “reasonable” order and the workers were willing to number the boxes themselves. The entire procedure was still very closely supervised by library staff. Thousands upon thousands of books were decontaminated, yet only a handful were damaged, lost or discarded during this process.

Although we were concerned about the decontamination procedure for our entire collection, we were especially concerned about our rare book collection (approximately 200 volumes). We informed the company overseeing the decontamination procedure that we would not allow one book to be moved unless a separate set of tests revealed evidence of toxic mould. Valued at several hundred thousand dollars, with several volumes in fragile and delicate condition, we didn't want anyone even touching these books, never mind vacuuming them. A conservator had inspected the collection a year earlier and concluded that the books were in good condition with no new active mould. They had been stored in a separate room in the library, whose door was closed 16 hours a

day. The rare book collection was sufficiently far from the contaminated ceiling tile, so we doubted the presence of toxic spores. Air samples confirmed that none of the species found was a human pathogen and we were able to move these books without any treatment. We were very relieved.

Spores, either active or dormant are everywhere and good housekeeping and proper filtration notwithstanding, no atmosphere can be completely free of organisms (Northeast Document Conservation Center 1994). It is possible, however, to inhibit mould growth by controlling temperature, humidity, air circulation, and light and regularly inspecting heating/ventilation/air conditioning (HVAC) units. There is no shortage of literature discussing these factors (NDCC 1994; Nyberg 1987; Conservation Center for Art and Historic Artifacts 1994). Periodic inspections of the books for signs of visible mould are also essential. Even though not all moulds are toxic to humans they still can damage, even destroy books. Treatment methods are varied and may include fumigation, fungicidal and fungistatic measures, freeze drying, fogging, Lysol® wipe down, bleach solution wipe down, and HEPA vacuuming. Conservators and other professionals with "mould" experience should be consulted to help develop an appropriate remediation plan. Be aware that some treatment methods may be more hazardous to human health than the fungi they are meant to eliminate. A variety of fungicidal materials and chemical treatments involving thymol, ortho-phenyl phenol, ethylene oxide, paradichlorobenzene, and carbon dioxide are hazardous to human health and are not recommended (Nyberg 1987).

When it comes to a toxic mould such as SA, the presence of visible mould, evidence of water damage and symptoms consistent with an allergic or toxic response to SA severe enough to result in lost work days (as judged by medical documentation) are clear indications that a site inspection is necessary. This may require bulk sampling and air monitoring (Special Appendix 1994). The involvement of health officials and professionals trained in the handling of hazardous materials is essential.

Because of the ubiquitous nature of spores, no environment can ever be completely free of spores. Not all moulds are toxic, however, moulds are powerful sensitizers and exposure to them can lead to debilitating allergy even among persons not prone to allergies (NDCC 1994). Because adverse health effects of SA depend on exposure circumstances and levels, repeated exposure should be avoided (Johanning *et al.* 1993). Levels of SA in the library were low (6 CFU/m³) yet we were extremely fortunate that none of the library staff presented symptoms or became ill but mould-related health complaints in libraries and office buildings are a reality. Library personnel at the University of Minnesota in Duluth complained about breathing problems, eye irritations, and skin rashes caused by (unnamed) mould and fungal spores released after books were handled during a barcoding project. Staff were given gloves and masks and encouraged to use them ("Illnesses Linked to Mold" 1993). Shortly after a \$1.9 million renovation, the Tottenville Public Library on Staten Island discovered SA and other toxic moulds. The library hired environmental consultants to conduct tests at the request of a doctor

who was treating a library employee for persistent bronchial problems. The library was closed and employees were reassigned to other branches (Holloway 1997). Within two months of the Tottenville closure, two other branches of the New York Public Library shut down because of SA (Lii 1997). In May of 1994, a group of staff and former staff filed a \$400,000,000 suit against the New Museum of Contemporary Art, charging the museum with responsibility for disabilities caused by the growth of SA in the sub-basement of the museum exhibit space (Motylewski 1994). America's love for litigation notwithstanding, the lawsuit illustrates the extent to which employees want their health concerns taken seriously. According to Monona Rossol of Artists, Crafts and Theater Safety (ACTS), it appears the suit was settled out of court with no public information given about awards or outcome (personal communication September 2, 1998).

As we look to the electronic future, let's not only remember our archival past but work diligently to preserve and conserve it. Let's continue (or begin) to ensure our libraries are safe places to work. Addressing the occupational health and safety needs of library personnel must be a constant concern. Certain fungi may be more detrimental to books than humans and certain toxic fungi may have more serious implications for human health than book health, but they are not mutually exclusive and should never be compromised.

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